Understanding and using custom output formats with Midra™ series

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Introduction

There are about twenty computer resolutions used by standard displays systems today. However, some applications may require a native format that isn't on this list. Two typical examples of odd resolution devices are LED walls and industrial displays. These displays often have different constraints: their resolution may be smaller than 640x480, their width, height and aspect ratio may not be standard and their orientation may be portrait instead of landscape. Even if they often accept standard resolution using the top left area of the format, using exact format is the best practice in switchers. The operator can then use a full screen layer to fill the custom display.

1 Why are custom output formats useful?

The **Midra™** series supports computer formats that are specified by the VESA (Video Electronics Standards Association). Three standards are supported:

- GTF (Generalized Timing Formula) version 1.1
- CVT (Coordinated Video Timings) version 1.1
- DMT (Display Monitor Timing) version 1.0 rev12

When setting the output format of a **Midra™** switcher, a list of predefined resolutions is available:

- 640 x 480 4/3
- 800 x 600 4/3
- 848 x 480 16/9
- 1024 x 768 4/3
- 1152 x 864 4/3
- 1280 x 720 16/9
- 1280 x 768 15/9
- 1280 x 800 16/10
- 1280 x 960 4/3
- 1280 x 1024 5/4
- 1360 x 768 16/9
- 1360 x 1024 4/3
- 1366 x 768 16/9
- 1366 x 800 ~15/9
- 1400 x 1050 4/3
- 1440 x 900 16/10
- 1600 x 900 16/9
- 1600 x 1200 4/3
- 1680 x 1050 16/10
- 1920 x 1080 16/9
- 1920 x 1200 16/10
- 2048 x 1080 ~17/9
- 2048 x 1152 16/9

These resolutions are used in standard applications: they start from VGA resolution and all are landscape oriented. Some applications however may require smaller or custom resolutions and may be portrait oriented.

LED wall example

Usually, a standard output resolution is used to send data to a LED wall sending unit. This standard format is often larger and may not be oriented (landscape or portrait) the same as the wall is. It forces the user to use a PIP with a size equal to the wall and placed in the top left corner of the output format.
Using a custom output format adjusted to the resolution of a LED wall has many advantages:

- Your Layer can be set to fullscreen: you don't need to compute any offset or scale factor.
- On the interface of the control software, your Program and Preview will be more comfortable to work with as they look like the real wall (same aspect ratio)

The Custom Output Format feature enables the creation of any output format, as long as it is compliant with the device capabilities.

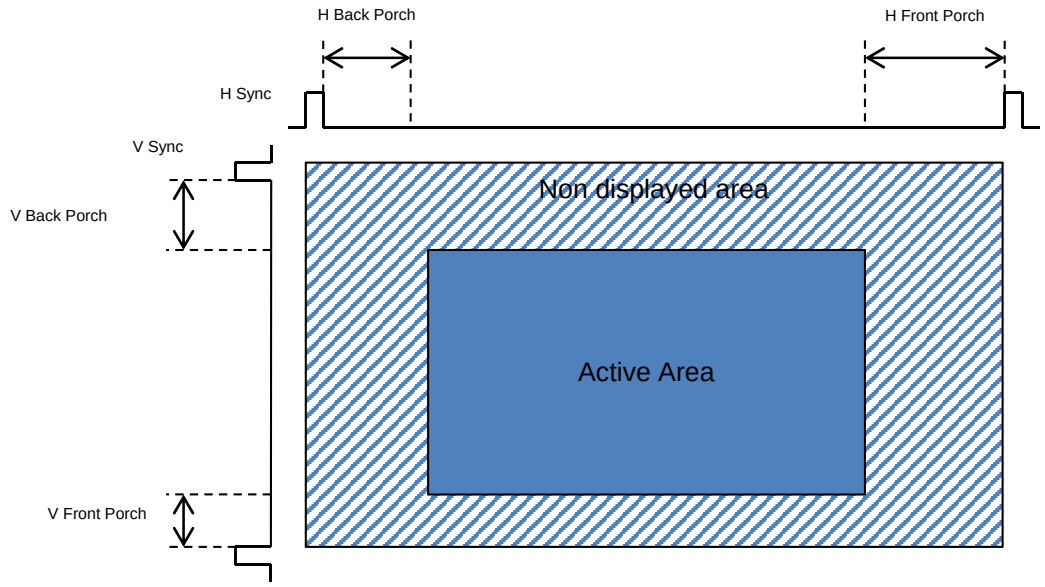
The **Midra™** series offers 2 modes to create custom output formats:

- The **CVT mode**: this is a basic and fast mode that fulfills most users' needs
- The **Full mode**: this is an advanced user mode that gives control of each parameter of the output format

2 How is the video data transmitted?

The video data consists of a succession of frames. Each frame is made of lines, themselves made of pixels. The frequency of the frames is often called "**Frame Rate**".
In the case of interlaced formats, the frame is divided into 2 fields: one containing the odd lines and the other one containing the even lines.
A frame is composed of three parts:

- The visible part (what is really displayed) called the **Active Area**
- Two non-displayed areas :
  - The **Vertical Blanking Interval** containing:
    - The **Vertical Sync** that indicates the start of a new frame. Its size is in lines
    - The **Vertical Back Porch** is the number of lines between the end of the Vertical Sync and the first line of the Active Area
    - The **Vertical Front Porch** is the number of lines between the end of the Active Area and the next Vertical Sync
  - The **Horizontal Blanking Interval** containing:
    - The **Horizontal Sync** that indicates the start of a new line. Its size is in pixels
    - The **Horizontal Back Porch** is the number of pixels between the end of the Horizontal Sync and the first pixel of the Active Area
    - The **Horizontal Front Porch** is the number of pixels between the end of the Active Area and the next Horizontal Sync



Simple mathematical relationships link the different values together:

- V Blanking Interval = V sync + V Back Porch + V Front Porch
- H Blanking Interval = H sync + H Back Porch + H Front Porch
- V Total Size = V Blanking Interval + Active Area Height
- H Total Size = H Blanking Interval + Active Area Width
- Line Frequency = Frame Rate x V Total Size
- Pixel Frequency = Line Frequency x H Total Size = Frame Rate x V Total Size x H Total Size

3 Creating and using custom output formats using the RCS²

Once the **RCS²** is connected to the **Midra™** device, enter the **Setup** mode located in the top left corner of the interface and select the **OUTPUTS** section.

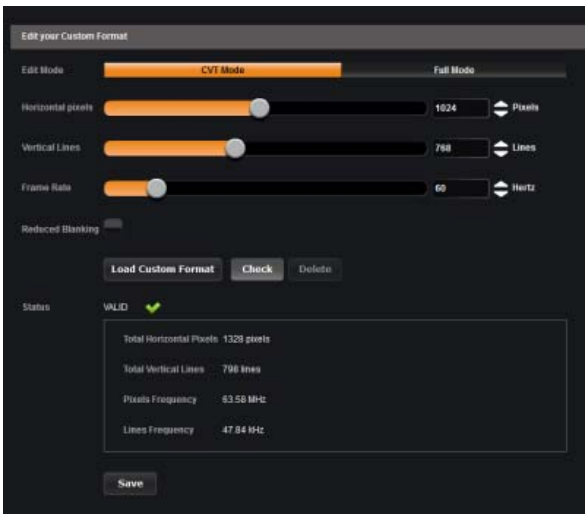
On the left side of the interface, now select **Custom Format**

Depending on your need on your user experience, choose the **Edit Mode** you want to use

3.1 Creating a custom output format using the CVT Mode

The CVT mode offers **a simplified interface** to create a custom output format. The only parameters to specify are:

- The **Active Area Height** (unit : lines) : the number of visible lines
- The **Active Area Width** (unit : pixels) : the number of visible pixels per lines
- The **Frame Rate** (unit : Hz) : the number of frames per second
- **Reduced Blanking** (Yes/ No): this must be enabled with high resolution formats to create the format with smaller blanking intervals. If not enabled, the H Total Size and V Total Size may be too large, inducing too high pixel frequency compared to the device capabilities



Once the parameters are set, they must be checked to verify that they are compliant with the CVT standard and if they are compatible with the device capabilities.
During the checking phase, the device automatically computes the other parameters using the CVT rules and confirms the device capabilities:

- H&V Sync size
- H&V Blanking interval size
- H&V sync polarity

3.2 Creating a custom output format using the Full Mode

The Full Mode gives **total access to the parameters** to create a custom output format:

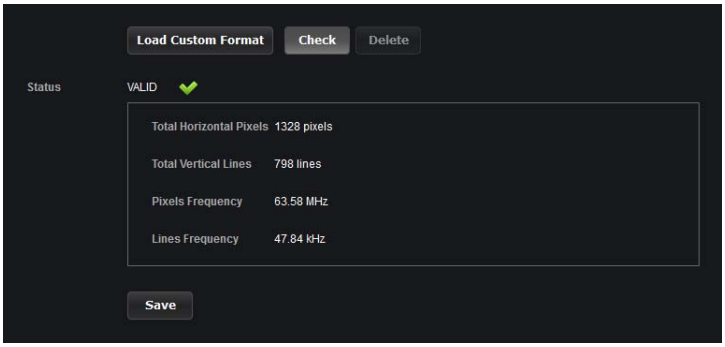
- The **Active Area Width** (unit: pixels) : the number of visible pixels per line
- The **H Sync Width** (unit: pixels)
- The **H Front and Back porches** (unit: pixels)
- The **Active Area Height** (unit: lines) : the number of visible lines
- The **V Sync Height** (unit: lines)
- The **V Front and Back porches** (unit: lines)
- The **Sync polarity** (positive or negative)
- The **Frame Rate** (unit: Hz) : the number of frames per second

Once the parameters are set, they must be checked to verify that they are compatible with the device capabilities.

3.3 Checking and saving a custom output format

When checking a format, the device also updates the format status area that contains the following information:

- The total number of pixels per line (including horizontal blanking interval)
- The total number of vertical lines (including vertical blanking interval)
- The pixel frequency
- The line frequency



A format may be considered invalid if one of these conditions is encountered:

- The pixel frequency is too low: the minimal pixel frequency for DVI is 25MHz
- The pixel frequency is too high: the maximal frequency pixel supported by **Midra™** devices is 165MHz
- The total number of pixels per line is too small: the minimal total number of pixels per lines supported by **Midra™** is 640

Once a custom output format is checked and considered valid, it can be saved in one of the 10 memory slots of the **Midra™** device.

3.4 Using a custom output format

Custom output formats can be applied to output 1 or output 2 of a **Midra™** device. They can be found and selected at the end of the format list. Just like for standard formats, click on "Apply" to complete the process.

Conclusion

With the custom Output Formats feature, the **Midra™** series makes life easier for those who need nonstandard resolutions for their applications: never again will an odd display cause you problems!